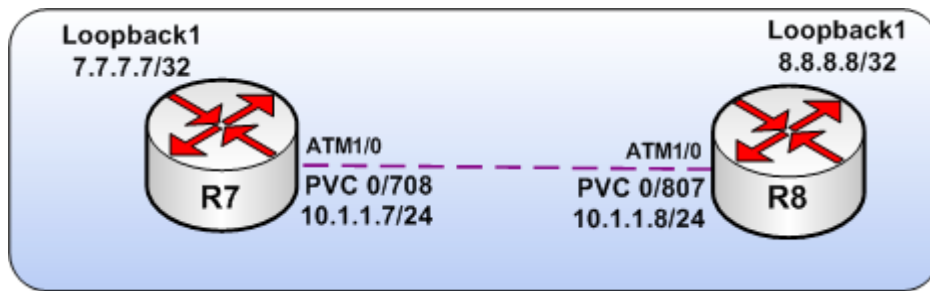


Lab 1 - ATM PVC Multi-point Sub-Interface using Dynamic Mapping



Task 1: Configure an ATM PVC between R7 and R8 using a multi-point sub-interface and aal5snap encapsulation. Do not use static maps.

Add the loopbacks 7.7.7.7/32 and 8.8.8.8/32 to each respective router.

Solution:

Note - When using inverse arp with ATM, you will be unable to ping the routers own interface address, This is due to the ip not being dynamically mapped to a pvc.

R7 Configuration:

```
interface loopback 1
ip addr 7.7.7.7 255.255.255.255
no shut
!
interface ATM1/0
no shut
interface ATM1/0.708 multipoint
ip address 10.1.1.7 255.255.255.0
no atm enable-ilmi-trap
no clns route-cache
pvc 0/708
encapsulation aal5snap
!
end
```

R8 Configuration:

```
interface loopback 1
ip addr 8.8.8.8 255.255.255.255
no shut
!
interface ATM1/0
```

```
no shut
interface ATM1/0.807 multipoint
ip address 10.1.1.8 255.255.255.0
no atm enable-ilmi-trap
no clns route-cache
pvc 0/708
encapsulation aal5snap
!
end
```

Verification on R7:

```
R7#ping 10.1.1.8
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/11/16 ms

```
R7#show atm pvc
```

	VCD /				Peak	Avg/Min	Burst			
Interface	Name	VPI	VCI	Type	Encaps	SC	Kbps	Kbps	Cells	Sts
1/0.708	1	0	708	PVC	SNAP	UBR	155000			UP

```
R7#show atm map
```

Map list ATM1/0.708_ATM_INARP : DYNAMIC

ip 10.1.1.8 maps to VC 1, VPI 0, VCI 708, **ATM1/0.708**

Verification on R8

```
R8#ping 10.1.1.7
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/16/36 ms

```
R8#show atm pvc
```

	VCD /				Peak	Avg/Min	Burst			
Interface	Name	VPI	VCI	Type	Encaps	SC	Kbps	Kbps	Cells	Sts
1/0.807	1	0	807	PVC	SNAP	UBR	155000			UP

```
R8#show atm map
```

```
Map list ATM1/0.807_ATM_INARP : DYNAMIC
ip 10.1.1.7 maps to VC 1, VPI 0, VCI 807, ATM1/0.807
```

Task 2: Configure both routers to send inverse arp messages at 1minute intervals for the active PVC's.

Solution:

Note the default inverse-arp interval is 15minutes for ATM interfaces. This can be changed with the **inarp** command from the pvc configuration mode.

```
R7#show atm pvc 0/708
ATM1/0.708: VCD: 1, VPI: 0, VCI: 708
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC status: Not Managed
ILMI VC status: Not Managed
InARP frequency: 15 minutes(s)
InPkts: 17, OutPkts: 18, InBytes: 1676, OutBytes: 1704
InPRoc: 17, OutPRoc: 18, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
Giants: 0
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
OAM cells sent: 0
F5 OutEndloop: 0, F5 OutSegloop: 0, F5 OutAIS: 0, F5 OutRDI: 0
OAM cell drops: 0
Status: UP
```

Configuration on R7:

```
R7(config-if)#int atm1/0.708
R7(config-if)#pvc 0/708
R7(config-if-atm-vc)#inarp ?
<1-60> InARP Frequency in minutes
<cr>

R7(config-if-atm-vc)#inarp 1
R7(config-if-atm-vc)#end
```

Configuration on R8:

```
R8(config)#int atm1/0.807
R8(config-if)#pvc 0/807
R8(config-if-atm-vc)#inarp 1
R8(config-if-atm-vc)#end
```

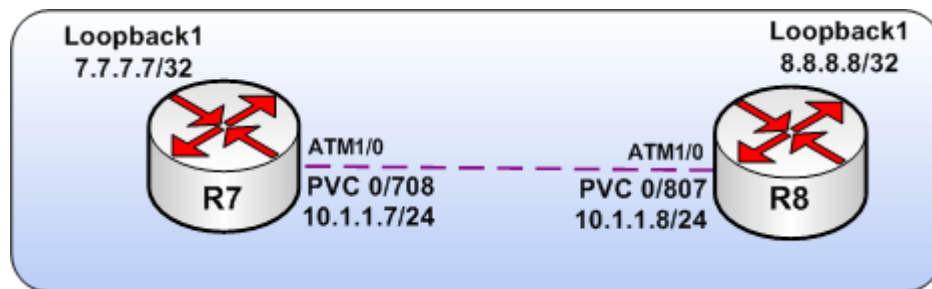
Verification:

```
R7#show atm pvc 0/708
ATM1/0.708: VCD: 1, VPI: 0, VCI: 708
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC status: Not Managed
ILMI VC status: Not Managed
InARP frequency: 1 minutes(s)
InPkts: 1, OutPkts: 1, InBytes: 28, OutBytes: 28
InPRoc: 24, OutPRoc: 25, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
Giants: 0
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
OAM cells sent: 0
F5 OutEndloop: 0, F5 OutSegloop: 0, F5 OutAIS: 0, F5 OutRDI: 0
OAM cell drops: 0
Status: UP
```

```
R8#show atm pvc 0/807
ATM1/0.807: VCD: 1, VPI: 0, VCI: 807
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC status: Not Managed
ILMI VC status: Not Managed
InARP frequency: 1 minutes(s)
InPkts: 1, OutPkts: 1, InBytes: 28, OutBytes: 28
InPRoc: 27, OutPRoc: 27, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
Giants: 0
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
OAM cells sent: 0
F5 OutEndloop: 0, F5 OutSegloop: 0, F5 OutAIS: 0, F5 OutRDI: 0
OAM cell drops: 0
Status: UP
```

Lab completed, Erase config and continue to next lab.

Lab 1-1 - ATM PVC Multi-point Sub-Interface using Dynamic Mapping Broadcast/Multicast – Ospf



This lab uses Lab 5 “ATM PVC Multi-point Sub-Interface using Dynamic Mapping” as its initial configuration.

Task 1: Enable Ospf process id 1 and use the network statement 0.0.0.0 255.255.255.255 area 0.

Solution:

Note – As the ATM multipoint sub-interface defaults to Ospf network type non-broadcast and no neighbor statement has been used, an adjacency will not form between the two devices. The use of either neighbor statements or enabling broadcasts can be used to resolve this.

R7 Configuration:

```
R7(config-router)#do show run | b router Ospf
router Ospf 1
router-id 7.7.7.7
log-adjacency-changes
network 0.0.0.0 255.255.255.255 area 0
```

R8 Configuration:

```
R8(config-router)#do show run | b router osprey
router Ospf 1
router-id 8.8.8.8
log-adjacency-changes
network 0.0.0.0 255.255.255.255 area 0
```

Verification on R7:

```
R7#show ip Ospf neigh
```

```
R7#show ip Ospf int atm1/0
```

```
ATM1/0.708 is up, line protocol is up
Internet Address 10.1.1.7/24, Area 0
Process ID 1, Router ID 7.7.7.7, Network Type NON_BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 7.7.7.7, Interface address 10.1.1.7
No backup designated router on this network
Timer intervals configured, Hello 30, Dead 120, Wait 120, Retransmit 5
  oob-resync timeout 120
  Hello due in 00:00:01
Supports Link-local Signaling (LLS)
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 0, maximum is 0
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
```

```
R7#
```

Verification on R8

```
R8#show ip Ospf neigh
```

```
R8#show ip Ospf inter atm1/0
```

```
ATM1/0.807 is up, line protocol is up
Internet Address 10.1.1.8/24, Area 0
Process ID 1, Router ID 8.8.8.8, Network Type NON_BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 8.8.8.8, Interface address 10.1.1.8
No backup designated router on this network
Timer intervals configured, Hello 30, Dead 120, Wait 120, Retransmit 5
  oob-resync timeout 120
  Hello due in 00:00:06
Supports Link-local Signaling (LLS)
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 0, maximum is 0
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
```

```
R8#
```

Task 2: Configure the appropriate neighbor statements on R7 and R8

Solution:

R7 Configuration:

```
R7(config-router)#do show run | b router Ospf
router Ospf 1
neighbor 10.1.1.8
```

R8 Configuration:

```
R8(config-router)#do show run | b router Ospf
router Ospf 1
neighbor 10.1.1.7
```

Verification on R7:

```
R7#show ip Ospf neigh
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
8.8.8.8	1	FULL/DR	00:01:37	10.1.1.8	ATM1/0.708

```
R7#ping 8.8.8.8 source loop1
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:

Packet sent with a source address of 7.7.7.7

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/23/44 ms

```
R7#
```

Verification on R8

```
R8#show ip Ospf neigh
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
7.7.7.7	1	FULL/BDR	00:01:45	10.1.1.7	ATM1/0.807

```
R8#ping 7.7.7.7 source loop1
```

Type escape sequence to abort.

```
Sending 5, 100-byte ICMP Echos to 7.7.7.7, timeout is 2 seconds:
Packet sent with a source address of 8.8.8.8
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/22/44 ms
R8#
```

Task 3: Remove the neighbor statement from both R7 and R8

Solution:

R7 Configuration:

```
R7(config-router)# no neighbor 10.1.1.8
```

R8 Configuration:

```
R8(config-router)#no neighbor 10.1.1.7
```

Task 4: Change the ATM Sub-interface Ospf network type to Broadcast on both routers.

Solution:

Note – As the atm1/0 interfaces are not configured to propagate broadcasts the adjacency will not form, below is the output from a debug ip packet

R7 Configuration:

```
R7(config)#int atm1/0.708
R7(config-if)#ip Ospf network broadcast
R7(config-if)# end
```

R8 Configuration:

```
R8(config)#int atm1/0.807
R8(config-if)#ip Ospf network broadcast
R8(config-if)#end
```

Debug Output:

```
R7#debug ip packet
IP packet debugging is on
R7#
R7#
R7#
00:16:27: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast
00:16:27: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed
00:16:37: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast
00:16:37: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed
00:16:47: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast
00:16:47: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed
00:16:57: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast
00:16:57: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed
```

Task 5: Enable the ability to send pseudo broadcasts on each PVC.

Solution:

R7 Configuration:

```
R7(config)#int atm1/0.708
R7(config-if)#pvc 0/708
R7(config-if-atm-vc)#broadcast
R7(config-if-atm-vc)# end
```

R8 Configuration:

```
R8(config)#int atm1/0.807
R8(config-if)#pvc 0/807
R8(config-if-atm-vc)#broadcast
R8(config-if-atm-vc)# end
```

Debug Output:

```
R7(config)#int atm1/0.708
R7(config-if)#pvc 0/708
00:22:17: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast
00:22:17: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed.1.8 bro
R7(config-if-atm-vc)#broadcast
R7(config-if-atm-vc)#
00:22:27: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast
00:22:27: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending full packet d
```

Verification on R7:

R7#show ip Ospf neigh

Neighbor ID	Pri	State	Dead Time	Address	Interface
8.8.8.8	1	FULL/BDR	00:00:31	10.1.1.8	ATM1/0.708

R7#show ip Ospf int atm1/0

ATM1/0.708 is up, line protocol is up

Internet Address 10.1.1.7/24, Area 0

Process ID 1, Router ID 7.7.7.7, **Network Type BROADCAST**, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 8.8.8.8, Interface address 10.1.1.8

Backup Designated router (ID) 7.7.7.7, Interface address 10.1.1.7

Flush timer for old DR LSA due in 00:00:56

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

Hello due in 00:00:06

Supports Link-local Signaling (LLS)

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 8.8.8.8 (Designated Router)

Suppress hello for 0 neighbor(s)

R7#

Verification on R8:

R8#show ip Ospf neigh

Neighbor ID	Pri	State	Dead Time	Address	Interface
7.7.7.7	1	FULL/BDR	00:00:31	10.1.1.7	ATM1/0.807

R8#

R8#show ip Ospf int atm1/0

ATM1/0.807 is up, line protocol is up

Internet Address 10.1.1.8/24, Area 0

Process ID 1, Router ID 8.8.8.8, **Network Type BROADCAST**, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 8.8.8.8, Interface address 10.1.1.8

Backup Designated router (ID) 7.7.7.7, Interface address 10.1.1.7

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

Hello due in 00:00:04

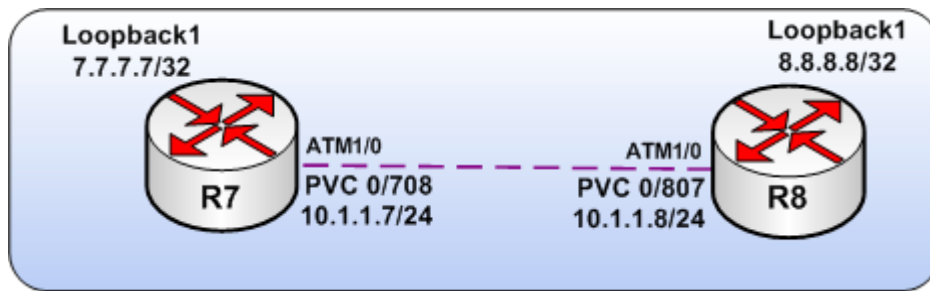
Supports Link-local Signaling (LLS)

```
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 4 msec
Neighbor Count is 1, Adjacent neighbor count is 1
  Adjacent with neighbor 7.7.7.7 (Backup Designated Router)
Suppress hello for 0 neighbor(s)
R8#
R8#ping 7.7.7.7 source loop1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 7.7.7.7, timeout is 2 seconds:
Packet sent with a source address of 8.8.8.8
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/16/36 ms
R8#
```

Lab completed, Erase config and continue to next lab.

Lab 2 - ATM PVC Multi-point Sub-interface using Static Mapping



Task 1: Configure an ATM PVC between R7 and R8 using a multi-point sub-interface and aal5snap encapsulation. Using only static mappings, Allow each router to ping itself and its neighbor

Add the loopbacks 7.7.7.7/32 and 8.8.8.8/32 to each respective router.

Solution:

Note - When configuring static maps, Broadcasts are not enabled by default, To enable broadcasts use the keyword broadcast at the end of the map.

R7 Configuration:

```
interface loopback 1
ip addr 7.7.7.7 255.255.255.255
no shut
!
interface ATM1/0
no shut
interface ATM1/0.708 multipoint
ip address 10.1.1.7 255.255.255.0
no atm enable-ilmi-trap
pvc 0/708
encapsulation aal5snap
no protocol ip inarp
protocol ip 10.1.1.7
protocol ip 10.1.1.8
!
end
```

R8 Configuration:

```
interface loopback 1
ip addr 8.8.8.8 255.255.255.255
no shut
!
interface ATM1/0
no shut
interface ATM1/0.807 multipoint
ip address 10.1.1.8 255.255.255.0
no atm enable-ilmi-trap
pvc 0/807
encapsulation aal5snap
no protocol ip inarp
protocol ip 10.1.1.7
protocol ip 10.1.1.8
!
end
```

Verification on R7:

```
R7#ping 10.1.1.8
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/11/20 ms

```
R7#ping 10.1.1.7
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 16/26/56 ms

```
R7#show atm map
```

```
Map list ATM1/0.708pvc2C4 : PERMANENT
```

```
ip 10.1.1.7 maps to VC 2, VPI 0, VCI 708, ATM1/0.708
```

```
ip 10.1.1.8 maps to VC 2, VPI 0, VCI 708, ATM1/0.708
```

Verification on R8

```
R8#ping 10.1.1.7
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

```
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms

R8#ping 10.1.1.8

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 16/23/52 ms

R8#show atm map
Map list ATM1/0.807pvc327 : PERMANENT
ip 10.1.1.7 maps to VC 2, VPI 0, VCI 807, ATM1/0.807
ip 10.1.1.8 maps to VC 2, VPI 0, VCI 807, ATM1/0.807
```

The configuration from Task 1 is used as the starting point for lab 2-1.

Task 2: Configure R7 and R8 as per Task 1 guidelines, But DO NOT use the pvc command.

Solution:

Note – Previously, PVC configuration was performed with the **pvc** command under the atm sub-interface. The older style of configuration occurred with the **atm pvc** command under the atm sub-interface. This required the use of a map-list which defined the static ip maps which was then associated with the atm sub-interface.

R7 Configuration

```
interface ATM1/0.708
ip address 10.1.1.7 255.255.255.0
map-group 708PVC
atm pvc 6 0 708 aal5snap
no atm enable-ilmi-trap
no clns route-cache
end
```

```
Router#show run | b map-list
map-list 708PVC
ip 10.1.1.7 atm-vc 6
ip 10.1.1.8 atm-vc 6 broadcast
```

R8 Configuration

```
interface ATM1/0.807
ip address 10.1.1.8 255.255.255.0
```

```
map-group 807PVC
atm pvc 6 0 807 aal5snap
no atm enable-ilmi-trap
no clns route-cache
end
```

```
Router#show run | b map-list
map-list 807PVC
ip 10.1.1.8 atm-vc 6
ip 10.1.1.7 atm-vc 6 broadcast
```

Verification on R7

```
R7#ping 10.1.1.7
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 16/32/56 ms

```
R7#ping 10.1.1.8
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:

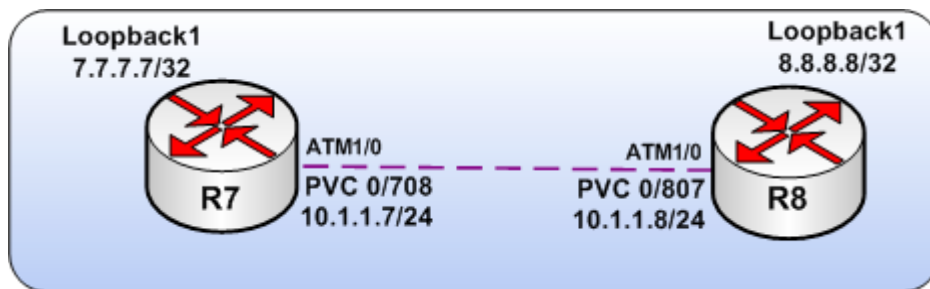
!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/9/12 ms

```
R7#
```

Lab completed, Erase config and continue to next lab.

Lab 2 -1 - ATM PVC Multi-point Sub-interface using Static Mapping Broadcast/Multicast - Ospf



This lab uses Lab 2 “ATM PVC Multi-point Sub-interface using Static Mapping” as its initial configuration.

Task 1: Enable Ospf process id 1 and use the network statement 0.0.0.0 255.255.255.255 area 0.

Solution:

Note – As the ATM multipoint sub-interface defaults to Ospf network type non-broadcast and as no neighbor statement has been used a adjacency will not form between the two devices. The use of either neighbor statements or enabling broadcasts can be used to resolve this.

R7 Configuration:

```
R7(config-router)#do show run | b router Ospf
router Ospf 1
router-id 7.7.7.7
log-adjacency-changes
network 0.0.0.0 255.255.255.255 area 0
```

R8 Configuration:

```
R8(config-router)#do show run | b router ospf
router Ospf 1
router-id 8.8.8.8
log-adjacency-changes
network 0.0.0.0 255.255.255.255 area 0
```

Verification on R7:

```
R7#show ip Ospf neigh
```

```
R7#show ip Ospf int atm1/0
```

```
ATM1/0.708 is up, line protocol is up
Internet Address 10.1.1.7/24, Area 0
Process ID 1, Router ID 7.7.7.7, Network Type NON_BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 7.7.7.7, Interface address 10.1.1.7
No backup designated router on this network
Timer intervals configured, Hello 30, Dead 120, Wait 120, Retransmit 5
  oob-resync timeout 120
  Hello due in 00:00:01
Supports Link-local Signaling (LLS)
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 0, maximum is 0
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
```

```
R7#
```

Verification on R8

```
R8#show ip Ospf neigh
```

```
R8#show ip Ospf inter atm1/0
```

```
ATM1/0.807 is up, line protocol is up
Internet Address 10.1.1.8/24, Area 0
Process ID 1, Router ID 8.8.8.8, Network Type NON_BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 8.8.8.8, Interface address 10.1.1.8
No backup designated router on this network
Timer intervals configured, Hello 30, Dead 120, Wait 120, Retransmit 5
  oob-resync timeout 120
  Hello due in 00:00:06
Supports Link-local Signaling (LLS)
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 0, maximum is 0
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
```

```
R8#
```

Task 2: Configure the appropriate neighbor statements on R7 and R8

Solution:

R7 Configuration:

```
R7(config-router)#do show run | b router Ospf
router Ospf 1
neighbor 10.1.1.8
```

R8 Configuration:

```
R8(config-router)#do show run | b router Ospf
router Ospf 1
neighbor 10.1.1.7
```

Verification on R7:

```
R7#show ip Ospf neigh
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
8.8.8.8	1	FULL/DR	00:01:37	10.1.1.8	ATM1/0.708

```
R7#ping 8.8.8.8 source loop1
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:

Packet sent with a source address of 7.7.7.7

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/23/44 ms

```
R7#
```

Verification on R8

```
R8#show ip Ospf neigh
```

Neighbor ID	Pri	State	Dead Time	Address	Interface
7.7.7.7	1	FULL/BDR	00:01:45	10.1.1.7	ATM1/0.807

```
R8#ping 7.7.7.7 source loop1
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 7.7.7.7, timeout is 2 seconds:

```
Packet sent with a source address of 8.8.8.8
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/22/44 ms
R8#
```

Task 3: Remove the neighbor statement from both R7 and R8

Solution:

R7 Configuration:

```
R7(config-router)# no neighbor 10.1.1.8
```

R8 Configuration:

```
R8(config-router)#no neighbor 10.1.1.7
```

Task 4: Change the ATM1/0 Ospf network type to Broadcast on both routers.

Solution:

Note – As the atm1/0 sub-interfaces are not configured to propagate broadcasts the adjacency will not form, below is the output from a debug ip packet

R7 Configuration:

```
R7(config)#int atm1/0.708
R7(config-if)#ip Ospf network broadcast
R7(config-if)# end
```

R8 Configuration:

```
R8(config)#int atm1/0.807
R8(config-if)#ip Ospf network broadcast
R8(config-if)#end
```

Debug Output:

```
R7#debug ip packet
```

IP packet debugging is on

R7#

R7#

R7#

00:16:27: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast

00:16:27: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed

00:16:37: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast

00:16:37: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed

00:16:47: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast

00:16:47: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed

00:16:57: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast

00:16:57: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed

Task 5: Enable the propagation of broadcasts by modifying the ATM map statements on both devices.

Solution:

R7 Configuration:

```
R7(config)#int atm1/0.708
```

```
R7(config-if)#pvc 0/708
```

```
R7(config-if-atm-vc)#protocol ip 10.1.1.8 broadcast
```

```
R7(config-if-atm-vc)# end
```

R8 Configuration:

```
R8(config)#int atm1/0.807
```

```
R8(config-if)#pvc 0/807
```

```
R8(config-if-atm-vc)#protocol ip 10.1.1.8 broad
```

```
R8(config-if-atm-vc)# end
```

Debug Output:

```
R7(config)#int atm1/0.708
```

```
R7(config-if)#pvc 0/708
```

```
00:22:17: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast
```

```
00:22:17: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, encapsulation failed.1.8 bro
```

```
R7(config-if-atm-vc)#protocol ip 10.1.1.8 broadcast
```

```
R7(config-if-atm-vc)#
```

```
00:22:27: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending broad/multicast
```

```
00:22:27: IP: s=10.1.1.7 (local), d=224.0.0.5 (ATM1/0.708), len 76, sending full packet d
```

Verification on R7:

R7#show ip Ospf neigh

Neighbor ID	Pri	State	Dead Time	Address	Interface
8.8.8.8	1	FULL/BDR	00:00:31	10.1.1.8	ATM1/0.708

R7#show ip Ospf int atm1/0

ATM1/0.708 is up, line protocol is up

Internet Address 10.1.1.7/24, Area 0

Process ID 1, Router ID 7.7.7.7, **Network Type BROADCAST**, Cost: 1

Transmit Delay is 1 sec, State BDR, Priority 1

Designated Router (ID) 8.8.8.8, Interface address 10.1.1.8

Backup Designated router (ID) 7.7.7.7, Interface address 10.1.1.7

Flush timer for old DR LSA due in 00:00:56

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

Hello due in 00:00:06

Supports Link-local Signaling (LLS)

Index 1/1, flood queue length 0

Next 0x0(0)/0x0(0)

Last flood scan length is 1, maximum is 1

Last flood scan time is 0 msec, maximum is 0 msec

Neighbor Count is 1, Adjacent neighbor count is 1

Adjacent with neighbor 8.8.8.8 (Designated Router)

Suppress hello for 0 neighbor(s)

R7#

Verification on R8:

R8#show ip Ospf neigh

Neighbor ID	Pri	State	Dead Time	Address	Interface
7.7.7.7	1	FULL/BDR	00:00:31	10.1.1.7	ATM1/0.807

R8#

R8#show ip Ospf int atm1/0

ATM1/0.807 is up, line protocol is up

Internet Address 10.1.1.8/24, Area 0

Process ID 1, Router ID 8.8.8.8, **Network Type BROADCAST**, Cost: 1

Transmit Delay is 1 sec, State DR, Priority 1

Designated Router (ID) 8.8.8.8, Interface address 10.1.1.8

Backup Designated router (ID) 7.7.7.7, Interface address 10.1.1.7

Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5

oob-resync timeout 40

Hello due in 00:00:04

Supports Link-local Signaling (LLS)

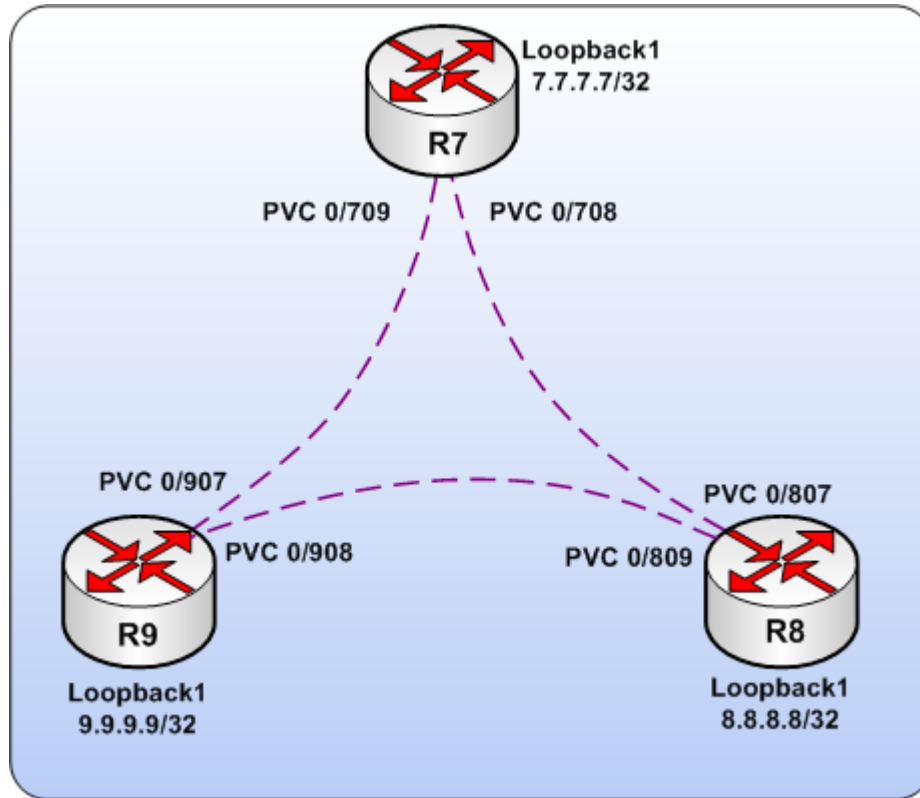
Index 1/1, flood queue length 0

```
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 4 msec
Neighbor Count is 1, Adjacent neighbor count is 1
  Adjacent with neighbor 7.7.7.7 (Backup Designated Router)
Suppress hello for 0 neighbor(s)
R8#
R8#ping 7.7.7.7 source loop1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 7.7.7.7, timeout is 2 seconds:
Packet sent with a source address of 8.8.8.8
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/16/36 ms
R8#
```

Lab completed, Erase config and continue to next lab.

LAB 3 - ATM Multi-point Sub-interface – Full Mesh PVC



R7 – ATM1/0.789	10.1.1.7/24
R8 – ATM1/0.789	10.1.1.8/24
R9 – ATM1/0.789	10.1.1.9/24

Task 1: Configure R7, R8 and R9's ATM1/0.789 multi-point sub-interfaces with the ip addresses shown. Configure each PVC to use aal5snap encapsulation. Do not use static mappings.

Solution:

Note – As this is a full mesh environment the use of dynamic mapping works without a problem, If this was a hub/spoke environment with R7 as the hub. R8 would not be able to communicate with R9, Static maps would be required to allow communication.

R7 Configuration:

```
interface ATM1/0.789
  no shut
interface ATM1/0.789 multipoint
  ip address 10.1.1.7 255.255.255.0
  no atm enable-ilmi-trap
```

```
pvc 0/708
encapsulation aal5snap
!
pvc 0/709
encapsulation aal5snap
!
end
```

R8 Configuration:

```
interface ATM1/0.789
no shut
interface ATM1/0.789 multipoint
ip address 10.1.1.8 255.255.255.0
no atm enable-ilmi-trap
pvc 0/807
encapsulation aal5snap
!
pvc 0/809
encapsulation aal5snap
!
end
```

R9 Configuration:

```
interface ATM1/0.789
no shut
interface ATM1/0.789 multipoint
ip address 10.1.1.9 255.255.255.0
no atm enable-ilmi-trap
pvc 0/907
encapsulation aal5snap
!
pvc 0/908
encapsulation aal5snap
!
end
```

Verification on R7:

```
R7#show atm map
Map list ATM1/0.789_ATM_INARP : DYNAMIC
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 708, ATM1/0.789
ip 10.1.1.9 maps to VC 4, VPI 0, VCI 709, ATM1/0.789
```

```
R7#show atm pvc
```

VCD /		Peak Avg/Min Burst								
Interface	Name	VPI	VCI	Type	Encaps	SC	Kbps	Kbps	Cells	Sts
1/0	3	0	708	PVC	SNAP	UBR	155000			UP
1/0	4	0	709	PVC	SNAP	UBR	155000			UP

R7#ping 10.1.1.8

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 12/34/76 ms

R7#ping 10.1.1.9

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.9, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/8/16 ms

R7#

Verification on R8

R8#show atm map

Map list ATM1/0.789 ATM_INARP : DYNAMIC

ip 10.1.1.7 maps to VC 2, VPI 0, VCI 807, ATM1/0.789

ip 10.1.1.9 maps to VC 3, VPI 0, VCI 809, ATM1/0.789

R8#show atm pvc

VCD /		Peak Avg/Min Burst								
Interface	Name	VPI	VCI	Type	Encaps	SC	Kbps	Kbps	Cells	Sts
1/0	2	0	807	PVC	SNAP	UBR	155000			UP
1/0	3	0	809	PVC	SNAP	UBR	155000			UP

R8#ping 10.1.1.7

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/11/16 ms

R8#ping 10.1.1.9

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.9, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/8/12 ms

R8#

Verification on R9

```

R9#show atm map
Map list ATM1/0.789_ATM_INARP : DYNAMIC
ip 10.1.1.7 maps to VC 2, VPI 0, VCI 907, ATM1/0.789
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 908, ATM1/0.789

R9#show atm pvc
      VCD /                               Peak Avg/Min Burst
Interface Name   VPI VCI Type Encaps  SC Kbps  Kbps  Cells Sts
1/0      2       0 907 PVC  SNAP  UBR 155000      UP
1/0      3       0 908 PVC  SNAP  UBR 155000      UP
R9#ping 10.1.1.7

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/11/16 ms
R9#ping 10.1.1.8

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/16/40 ms
R9#

```

Task 2: Broadcast/Multicast traffic is not being replicated across the ATM network, Without using static maps allow Broadcasts.

Solution:

Note – To allow Broadcasts across the PVC's the Broadcast keyword needs to be added in the PVC configuration,

R7 Configuration:

```

interface ATM1/0.789
pvc 0/708
broadcast
!
pvc 0/709
broadcast
!

```

R8 Configuration:

```

interface ATM1/0.789
pvc 0/807
broadcast
!

```

```
pvc 0/809  
broadcast  
!
```

R9 Configuration:

```
interface ATM1/0.789  
pvc 0/907  
broadcast  
!  
pvc 0/908  
broadcast  
!
```

Verification

Execute the show atm map command on each router, Notice the Broadcast keyword has been added for each dynamically learnt address.

```
R7#show atm map  
Map list ATM1/0.789_ATM_INARP : DYNAMIC  
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 708, ATM1/0.789  
    , broadcast  
ip 10.1.1.9 maps to VC 4, VPI 0, VCI 709, ATM1/0.789  
    , broadcast
```

Task 3: Remove the Broadcast keyword from each pvc and shut the ATM1/0.789 interface on each router.

Solution:

R7 Configuration:

```
interface ATM1/0.789  
shutdown  
pvc 0/708  
no broadcast  
!  
pvc 0/709  
no broadcast  
!
```

R8 Configuration:

```
interface ATM1/0.789
shutdown
pvc 0/807
no broadcast
!
pvc 0/809
no broadcast
!
```

R9 Configuration:

```
interface ATM1/0.789
shutdown
pvc 0/907
no broadcast
!
pvc 0/908
no broadcast
!
```

Task 4: Configure 3 static maps on each Router so that all ATM ip addresses are able to be pinged from each router. Broadcast are not required and Inverse arp should be disabled.

Solution:

Note – To allow the Router to ping its own address a static mapping is needed. If there are multiple options, Select a PVC that is active and in the same subnet. If this PVC goes down you will no longer be able to reach your own ip address.

R7 Configuration:

```
interface ATM1/0.789
ip address 10.1.1.7 255.255.255.0
no atm enable-ilmi-trap
pvc 0/708
protocol ip 10.1.1.7
protocol ip 10.1.1.8
encapsulation aal5snap
no protocol ip inarp
!
pvc 0/709
protocol ip 10.1.1.9
```

```
encapsulation aal5snap
no protocol ip inarp
!
end
```

R8 Configuration:

```
interface ATM1/0.789
ip address 10.1.1.8 255.255.255.0
no atm enable-ilmi-trap
pvc 0/807
protocol ip 10.1.1.7
protocol ip 10.1.1.8
encapsulation aal5snap
!
pvc 0/809
protocol ip 10.1.1.9
encapsulation aal5snap
no protocol ip inarp
!
end
```

R9 Configuration:

```
interface ATM1/0.789
ip address 10.1.1.9 255.255.255.0
no atm enable-ilmi-trap
pvc 0/907
protocol ip 10.1.1.7
protocol ip 10.1.1.9
encapsulation aal5snap
!
pvc 0/908
protocol ip 10.1.1.8
encapsulation aal5snap
!
end
```

Verification on R7

```
R7#show atm map
Map list ATM1/0.789pvc2C4 : PERMANENT
ip 10.1.1.7 maps to VC 3, VPI 0, VCI 708, ATM1/0.789
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 708, ATM1/0.789
```

```
Map list ATM1/0.789pvc2C5 : PERMANENT
ip 10.1.1.9 maps to VC 4, VPI 0, VCI 709, ATM1/0.789
```

R7#ping 10.1.1.7

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 16/20/28 ms

R7#ping 10.1.1.8

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 12/16/36 ms

R7#ping 10.1.1.9

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.9, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/12/16 ms

Verification on R8

R8#show atm map

Map list ATM1/0.789pvc329 : **PERMANENT**

ip 10.1.1.9 maps to VC 3, VPI 0, VCI 809, ATM1/0.789

Map list ATM1/0.789pvc327 : **PERMANENT**

ip 10.1.1.7 maps to VC 2, VPI 0, VCI 807, ATM1/0.789

ip 10.1.1.8 maps to VC 2, VPI 0, VCI 807, ATM1/0.789

R8#ping 10.1.1.7

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/16/40 ms

R8#ping 10.1.1.8

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 16/46/88 ms

R8#ping 10.1.1.9

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.9, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/9/12 ms

R8#

Verification on R9

R9#show atm map

Map list ATM1/0.789pvc38B : **PERMANENT**

ip 10.1.1.7 maps to VC 2, VPI 0, VCI 907, ATM1/0.789

ip 10.1.1.9 maps to VC 2, VPI 0, VCI 907, ATM1/0.789

Map list ATM1/0.789pvc38C : **PERMANENT**

ip 10.1.1.8 maps to VC 3, VPI 0, VCI 908, ATM1/0.789

R9#ping 10.1.1.7

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/9/12 ms

R9#ping 10.1.1.8

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/18/32 ms

R9#ping 10.1.1.9

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.9, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 16/24/48 ms

R9#

Task 5: Enable the ability to send broadcasts on the ATM network. Only enable this where required.

Solution:

Note – Enabling broadcasts for the Routers own address is not needed.

R7 Configuration:

```
interface ATM1/0.789
```

```
  pvc 0/708
```

```
    no broadcast
```

```
    protocol ip 10.1.1.7
```

```
protocol ip 10.1.1.8 broadcast
!  
pvc 0/709  
no broadcast  
protocol ip 10.1.1.9 broadcast  
!  
end
```

R8 Configuration:

```
interface ATM1/0.789  
pvc 0/807  
no broadcast  
protocol ip 10.1.1.7 broadcast  
protocol ip 10.1.1.8  
!  
pvc 0/809  
no broadcast  
protocol ip 10.1.1.9 broadcast  
!  
end
```

R9 Configuration:

```
interface ATM1/0.789  
pvc 0/907  
no broadcast  
protocol ip 10.1.1.7 broadcast  
protocol ip 10.1.1.9  
!  
pvc 0/908  
no broadcast  
protocol ip 10.1.1.8 broadcast  
!  
end
```

Verification on R7

```
R7#show atm map  
Map list ATM1/0.789pvc2C4 : PERMANENT  
ip 10.1.1.7 maps to VC 3, VPI 0, VCI 708, ATM1/0.789  
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 708, ATM1/0.789  
    , broadcast
```

```
Map list ATM1/0.789pvc2C5 : PERMANENT  
ip 10.1.1.9 maps to VC 4, VPI 0, VCI 709, ATM1/0.789  
    , broadcast
```

Verification on R8

```
R8#show atm map
Map list ATM1/0.789pvc329 : PERMANENT
ip 10.1.1.9 maps to VC 3, VPI 0, VCI 809, ATM1/0.789
, broadcast
```

```
Map list ATM1/0.789pvc327 : PERMANENT
ip 10.1.1.7 maps to VC 2, VPI 0, VCI 807, ATM1/0.789
, broadcast
ip 10.1.1.8 maps to VC 2, VPI 0, VCI 807, ATM1/0.789
```

Verification on R9

```
R9#show atm map
Map list ATM1/0.789pvc38B : PERMANENT
ip 10.1.1.7 maps to VC 2, VPI 0, VCI 907, ATM1/0.789
, broadcast
ip 10.1.1.9 maps to VC 2, VPI 0, VCI 907, ATM1/0.789
```

```
Map list ATM1/0.789pvc38C : PERMANENT
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 908, ATM1/0.789
, broadcast
```

Task 6: Remove the broadcast statements

Solution:

R7 Configuration:

```
interface ATM1/0.789
pvc 0/708
no protocol ip 10.1.1.8 broadcast
protocol ip 10.1.1.8
!
pvc 0/709
no protocol ip 10.1.1.9 broadcast
protocol ip 10.1.1.9
!
end
```

R8 Configuration:

```
interface ATM1/0.789
 pvc 0/807
  no protocol ip 10.1.1.7 broadcast
  protocol ip 10.1.1.7
 !
 pvc 0/809
  no protocol ip 10.1.1.9 broadcast
  protocol ip 10.1.1.9
 !
end
```

R9 Configuration:

```
interface ATM1/0.789
 pvc 0/907
  no protocol ip 10.1.1.7 broadcast
  protocol ip 10.1.1.7
 !
 pvc 0/908
  no protocol ip 10.1.1.8 broadcast
  protocol ip 10.1.1.8
 !
end
```

Verification on R7

```
R7#show atm map
Map list ATM1/0.789pvc2C4 : PERMANENT
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 708, ATM1/0.789
ip 10.1.1.8 maps to VC 2, VPI 0, VCI 807, ATM1/0.789

Map list ATM1/0.789pvc2C5 : PERMANENT
ip 10.1.1.9 maps to VC 4, VPI 0, VCI 709, ATM1/0.789
```

Verification on R8

```
R8#show atm map
Map list ATM1/0.789pvc327 : PERMANENT
ip 10.1.1.7 maps to VC 2, VPI 0, VCI 807, ATM1/0.789
ip 10.1.1.8 maps to VC 2, VPI 0, VCI 807, ATM1/0.789

Map list ATM1/0.789pvc329 : PERMANENT
ip 10.1.1.9 maps to VC 3, VPI 0, VCI 809, ATM1/0.789
```

Verification on R9

```
R9#show atm map
Map list ATM1/0.789pvc38B : PERMANENT
ip 10.1.1.7 maps to VC 2, VPI 0, VCI 907, ATM1/0.789
ip 10.1.1.9 maps to VC 2, VPI 0, VCI 907, ATM1/0.789

Map list ATM1/0.789pvc38C : PERMANENT
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 908, ATM1/0.789
```

Task 7: Enable the Broadcast capability using One statement per PVC, Do not use the protocol ip command to enable broadcasts. Do not broadcast to the Routers own address.

Solution:

R7 Configuration:

```
interface ATM1/0.789
 pvc 0/708
  broadcast
  protocol ip 10.1.1.7 no broadcast
 !
 pvc 0/709
  broadcast
 !
end
```

R8 Configuration:

```
interface ATM1/0.789
 pvc 0/807
  broadcast
  protocol ip 10.1.1.8 no broadcast
 !
 pvc 0/809
  broadcast
 !
end
```

R9 Configuration:

```
interface ATM1/0.789
 pvc 0/907
  broadcast
  protocol ip 10.1.1.9 no broadcast
```

```
!  
pvc 0/908  
  broadcast  
!  
end
```

Verification on R7

```
R7#show atm map  
Map list ATM1/0.789pvc2C4 : PERMANENT  
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 708, ATM1/0.789  
  , broadcast  
ip 10.1.1.7 maps to VC 3, VPI 0, VCI 708, ATM1/0.789
```

```
Map list ATM1/0.789pvc2C5 : PERMANENT  
ip 10.1.1.9 maps to VC 4, VPI 0, VCI 709, ATM1/0.789  
  , broadcast
```

Verification on R8

```
R8#show atm map  
Map list ATM1/0.789pvc327 : PERMANENT  
ip 10.1.1.7 maps to VC 2, VPI 0, VCI 807, ATM1/0.789  
  , broadcast  
ip 10.1.1.8 maps to VC 2, VPI 0, VCI 807, ATM1/0.789
```

```
Map list ATM1/0.789pvc329 : PERMANENT  
ip 10.1.1.9 maps to VC 3, VPI 0, VCI 809, ATM1/0.789  
  , broadcast
```

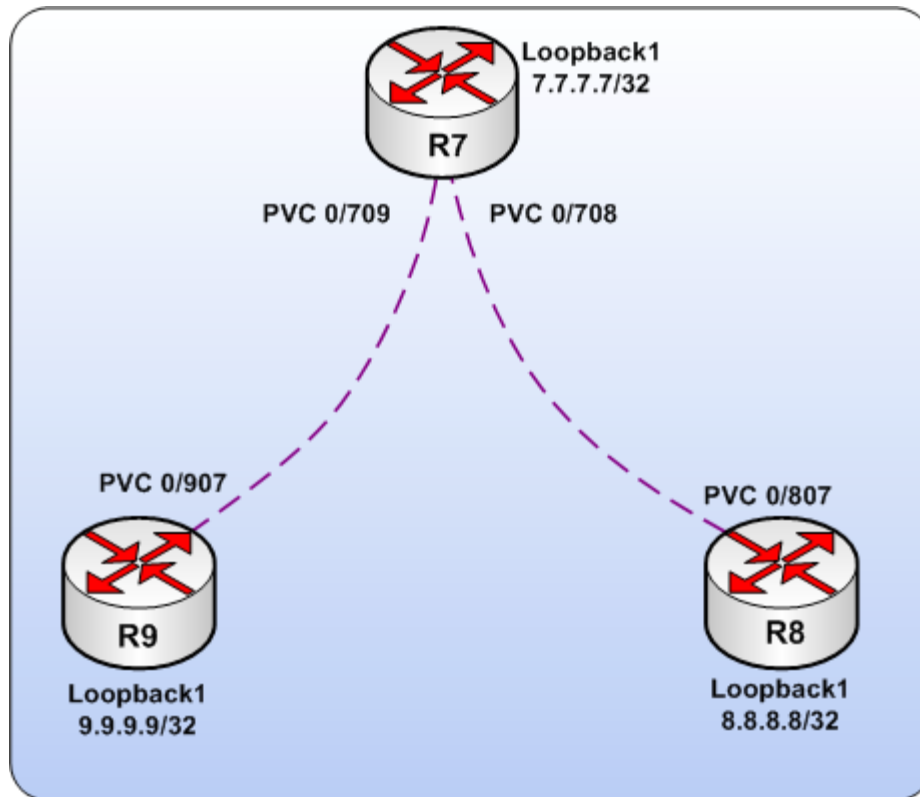
Verification on R9

```
R9#show atm map  
Map list ATM1/0.789pvc327 : PERMANENT  
ip 10.1.1.7 maps to VC 2, VPI 0, VCI 807, ATM1/0.789  
  , broadcast  
ip 10.1.1.9 maps to VC 2, VPI 0, VCI 807, ATM1/0.789
```

```
Map list ATM1/0.789pvc329 : PERMANENT  
ip 10.1.1.8 maps to VC 3, VPI 0, VCI 809, ATM1/0.789  
  , broadcast
```

Lab completed, Erase config and continue to next lab.

Lab 4 - ATM Multi-point Sub-interface Hub and Spoke



R7 – ATM1/0.789	10.1.1.7/24
R8 – ATM1/0.807	10.1.1.8/24
R9 – ATM1/0.907	10.1.1.9/24

Task 1: Configure R7, R8 and R9's ATM Multi-point Sub-interfaces with the ip addresses shown. Configure each PVC to use aal5snap encapsulation. Do not use static mappings.

Solution:

Note – R7 is the Hub device and R8/R9 are the spokes in this topology. When only dynamic mapping is used the two spokes are unable to communicate unless a routing protocol is used. A debug output showing this is included below.

R7 Configuration:

```
interface ATM1/0
  no shut
interface ATM1/0.789 multipoint
  ip address 10.1.1.7 255.255.255.0
```

```
no atm enable-ilmi-trap
pvc 0/708
encapsulation aal5snap
!
pvc 0/709
encapsulation aal5snap
!
end
```

R8 Configuration:

```
interface ATM1/0
no shut
interface ATM1/0.807 multipoint
ip address 10.1.1.8 255.255.255.0
no atm enable-ilmi-trap
pvc 0/807
encapsulation aal5snap
!
end
```

R9 Configuration:

```
interface ATM1/0
no shut
interface ATM1/0.907 multipoint
ip address 10.1.1.9 255.255.255.0
no atm enable-ilmi-trap
pvc 0/907
encapsulation aal5snap
!
end
```

Verification on R7:

```
R7#show atm map
Map list ATM1/0.789_ATM_INARP : DYNAMIC
ip 10.1.1.8 maps to VC 5, VPI 0, VCI 708, ATM1/0.789
ip 10.1.1.9 maps to VC 6, VPI 0, VCI 709, ATM1/0.789
```

```
R7#ping 10.1.1.8
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.8, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/14/24 ms

R7#ping 10.1.1.9

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.9, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/31/72 ms

Verification on R8

R8#show atm map

Map list ATM1/0.807 ATM_INARP : DYNAMIC

ip 10.1.1.7 maps to VC 6, VPI 0, VCI 807, ATM1/0.807

R8#ping 10.1.1.7

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/16/40 ms

Verification on R9

R9#show atm map

Map list ATM1/0.907 ATM_INARP : DYNAMIC

ip 10.1.1.7 maps to VC 4, VPI 0, VCI 907, ATM1/0.907

R9#ping 10.1.1.7

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/16/40 ms

Communication between Spokes fails – Debug.

R8#debug ip packet

IP packet debugging is on

R8#ping 10.1.1.9

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.9, timeout is 2 seconds:

19:27:59: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, sending

19:27:59: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, encapsulation failed.

19:28:01: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, sending

```
19:28:01: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, encapsulation failed.
19:28:03: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, sending
19:28:03: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, encapsulation failed.
19:28:05: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, sending
19:28:05: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, encapsulation failed.
19:28:07: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, sending
19:28:07: IP: s=10.1.1.8 (local), d=10.1.1.9 (ATM1/0.807), len 100, encapsulation failed.
Success rate is 0 percent (0/5)
```

Task 2: To allow communication between the spokes at Layer2, Static maps are required. Add a single Static map to the other spokes address on both R8 and R9

Solution:

Note – When static maps are used, Inverse arp messages are no longer sent and any addresses learnt via Inverse Arp are removed from the mapping table.

As R7 can no longer reach R8 or R9, traffic will now be dropped by R7, This is shown in the debug below. This can take a while to actually happen as the R7 inarp cache is still active.

R8 Configuration:

```
interface ATM1/0.807
 pvc 0/807
  protocol ip 10.1.1.9
!
```

R9 Configuration:

```
interface ATM1/0.907
 pvc 0/907
  protocol ip 10.1.1.8
!
```

Verification on R7

```
R7#show atm map
```

```
R7#
```

Verification on R8

```
R8#show atm map
Map list ATM1/0.807pvc327 : PERMANENT
```

ip 10.1.1.9 maps to VC 6, VPI 0, VCI 807, ATM1/0.807

Verification on R9

```
R9#show atm map
Map list ATM1/0.907pvc38B : PERMANENT
ip 10.1.1.8 maps to VC 4, VPI 0, VCI 907, ATM1/0.907
```

Testing communication between spokes - Debug

```
R8#ping 10.1.1.9
```

```
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.9, timeout is 2 seconds:
```

```
.....
Success rate is 0 percent (0/5)
```

```
R7#debug ip packet
IP packet debugging is on
```

```
R7#
```

```
19:42:20: IP: s=10.1.1.8 (ATM1/0.789), d=10.1.1.9 (ATM1/0.789), len 100, redirected
19:42:20: IP: s=10.1.1.7 (local), d=10.1.1.8 (ATM1/0.789), len 56, sending
19:42:20: IP: s=10.1.1.7 (local), d=10.1.1.8 (ATM1/0.789), len 56, encapsulation failed
19:42:20: IP: s=10.1.1.8 (ATM1/0.789), d=10.1.1.9 (ATM1/0.789), g=10.1.1.9, len 100, forward
19:42:20: IP: s=10.1.1.8 (ATM1/0.789), d=10.1.1.9 (ATM1/0.789), len 100, encapsulation failed
19:42:22: IP: s=10.1.1.8 (ATM1/0.789), d=10.1.1.9 (ATM1/0.789), len 100, redirected
19:42:22: IP: s=10.1.1.7 (local), d=10.1.1.8 (ATM1/0.789), len 56, sending
19:42:22: IP: s=10.1.1.7 (local), d=10.1.1.8 (ATM1/0.789), len 56, encapsulation failed
19:42:22: IP: s=10.1.1.8 (ATM1/0.789), d=10.1.1.9 (ATM1/0.789), g=10.1.1.9, len 100, forward
19:42:22: IP: s=10.1.1.8 (ATM1/0.789), d=10.1.1.9 (ATM1/0.789), len 100, encapsulation failed
```

Task 3: R8 and R9 do not have the ability to communicate with R7. Add a Static map on each spoke to resolve this.

Solution:

R8 Configuration:

```
interface ATM1/0.807
 pvc 0/807
  protocol ip 10.1.1.7
 !
```

R9 Configuration:

```
interface ATM1/0.907
 pvc 0/907
  protocol ip 10.1.1.7
!
```

Verification on R8

```
R8#show atm map
Map list ATM1/0.807pvc327 : PERMANENT
ip 10.1.1.7 maps to VC 6, VPI 0, VCI 807, ATM1/0.807
ip 10.1.1.9 maps to VC 6, VPI 0, VCI 807, ATM1/0.807
```

```
R8#ping 10.1.1.7
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/10/20 ms

Verification on R9

```
R9#show atm map
Map list ATM1/0.907pvc38B : PERMANENT
ip 10.1.1.7 maps to VC 4, VPI 0, VCI 907, ATM1/0.907
ip 10.1.1.8 maps to VC 4, VPI 0, VCI 907, ATM1/0.907
```

```
R9#ping 10.1.1.7
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.7, timeout is 2 seconds:

!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 4/12/20 ms

Task 4: Enable the ability to send broadcasts, Do not send redundant packets.

Solution:

Note – If the broadcast keyword is added to both **protocol ip** statements or the **broadcast** keyword is entered under the PVC configuration then the router will send two copies of each packet. This is shown in the debug below.

R8 Configuration:

```
interface ATM1/0.807
 pvc 0/807
```

```
protocol ip 10.1.1.7 broadcast
!
```

R9 Configuration:

```
interface ATM1/0.907
pvc 0/907
protocol ip 10.1.1.7 broadcast
!
```

Using the Broadcast keyword on both protocol ip statements – Debug

```
R8#
interface ATM1/0.807
pvc 0/807
broadcast
!
```

or

```
R8#
interface ATM1/0.807
pvc 0/807
protocol ip 10.1.1.7 broadcast
protocol ip 10.1.1.9 broadcast
!
R8#ping 10.1.1.255
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.255, timeout is 2 seconds:

```
Reply to request 0 from 10.1.1.7, 4 ms
Reply to request 0 from 10.1.1.7, 8 ms
Reply to request 1 from 10.1.1.7, 12 ms
Reply to request 1 from 10.1.1.7, 12 ms
Reply to request 2 from 10.1.1.7, 12 ms
Reply to request 2 from 10.1.1.7, 16 ms
Reply to request 3 from 10.1.1.7, 12 ms
Reply to request 3 from 10.1.1.7, 12 ms
Reply to request 4 from 10.1.1.7, 8 ms
Reply to request 4 from 10.1.1.7, 8 ms
R8#
```

Using the Broadcast keyword only for the Hub protocol ip statement - Debug

```
R8#
interface ATM1/0.807
pvc 0/807
```

```
protocol ip 10.1.1.7 broadcast
!  
R8#ping 10.1.1.255  
  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 10.1.1.255, timeout is 2 seconds:  
  
Reply to request 0 from 10.1.1.7, 4 ms  
Reply to request 1 from 10.1.1.7, 12 ms  
Reply to request 2 from 10.1.1.7, 8 ms  
Reply to request 3 from 10.1.1.7, 8 ms  
Reply to request 4 from 10.1.1.7, 12 ms  
R8#
```

Task 5: Remove the configuration added in Task 4.

Solution:

R8 Configuration:

```
interface ATM1/0.807  
pvc 0/807  
no protocol ip 10.1.1.7 broadcast  
protocol ip 10.1.1.7  
!
```

R9 Configuration:

```
interface ATM1/0.907  
pvc 0/907  
no protocol ip 10.1.1.7 broadcast  
protocol ip 10.1.1.7  
!
```

Task 6: Add the broadcast keyword to PVC 0/907 on R9 and PVC 0/807 on R8. Without removing this command prevent redundant broadcasts from being sent.

Solution:

Note – The PVC broadcast command enables broadcasts for all address maps, To prevent this on a single map entry use the following **protocol ip x.x.x.x no broadcast**

R8 Configuration:

```
interface ATM1/0.807
 pvc 0/807
  broadcast
  protocol ip 10.1.1.9 no broadcast
!
```

R9 Configuration:

```
interface ATM1/0.907
 pvc 0/907
  broadcast
  protocol ip 10.1.1.8 no broadcast
!
```

Verification on R8

```
R8#show atm map
Map list ATM1/0.807pvc327 : PERMANENT
ip 10.1.1.7 maps to VC 6, VPI 0, VCI 807, ATM1/0.807
, broadcast
ip 10.1.1.9 maps to VC 6, VPI 0, VCI 807, ATM1/0.807
```

```
R8#ping 10.1.1.255
```

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.255, timeout is 2 seconds:

```
Reply to request 0 from 10.1.1.7, 24 ms
Reply to request 1 from 10.1.1.7, 8 ms
Reply to request 2 from 10.1.1.7, 8 ms
Reply to request 3 from 10.1.1.7, 12 ms
Reply to request 4 from 10.1.1.7, 8 ms
R8#
```

Verification on R9

```
R9#show atm map
Map list ATM1/0.907pvc38B : PERMANENT
ip 10.1.1.7 maps to VC 4, VPI 0, VCI 907, ATM1/0.907
, broadcast
ip 10.1.1.8 maps to VC 4, VPI 0, VCI 907, ATM1/0.907
```

```
R9#ping 10.1.1.255
```

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 10.1.1.255, timeout is 2 seconds:

Reply to request 0 from 10.1.1.7, 16 ms

Reply to request 1 from 10.1.1.7, 32 ms

Reply to request 2 from 10.1.1.7, 12 ms

Reply to request 3 from 10.1.1.7, 16 ms

Reply to request 4 from 10.1.1.7, 24 ms

Lab completed, Erase config and continue to next lab.

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